Long Range Energy Planning Report

Bad River Band of Lake Superior Ojibway

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1 Executive Summary

The Bad River Band desires energy sovereignty in keeping with their core tribal values. In order to support this goal with practical project implementation over the course of the foreseeable future, we gathered to more comprehensively define the tribe's energy plans.

1.1 Overview

The tribal council met on December 4, 2019 to define a vision for the tribe's long range energy goals and to develop an initial plan to meet those goals. The tribal chairman, Mike Wiggins Jr., and the tribal council attended the meeting, along with members of the Air Quality division of the department of Natural Resources, tribal legal counsel. The meeting was facilitated by Amy Simpkins of muGrid Analytics and supported by Bill Bailey of Cheq Bay Renewables.

1.2 Background

The Bad River Band has been evaluating the feasibility of energy projects to reach their goals for quite some time.

The tribe has commissioned various studies to evaluate energy projects including behind-the-meter solar power, community solar, multi-technology microgrids, and biomass CHP.

Most recently the tribe – supported by Cheq Bay Renewables, muGrid Analytics, and Madison Solar – applied for and was awarded a Department of Energy (DOE) Office of Indian Energy grant during the 2019 application cycle. This award will fund resilient grid-connected solar-plus-storage projects at the health clinic, the waste water treatment plant, and the tribal administration building. The total project value was estimated at $2M and the DOE grant will cover $1M of that amount. Construction is expected to complete in the fall of 2020.

The tribe is currently served from Bayfield Electric's (BEC's) 5MW substation fed from Xcel's transmission line in Ashland.

1.3 Workshop Goals and Objectives

The primary goal of the long range energy planning workshop was to define the tribe's 10-year energy goals. We aimed to craft a "north star" vision that was simple, focused, and clear, so that all energy decisions going forward can be judged on their alignment with the vision. We asked the question, "What does the tribe's energy landscape look like in 2030?"

The second goal of the workshop was to draft a roadmap to achieve that vision. We identified general milestones for the course of the next decade, allowing flexibility for the vision to shift and new learning to be incorporated. We also identified specific next steps to move forward with the vision into 2020-2021.

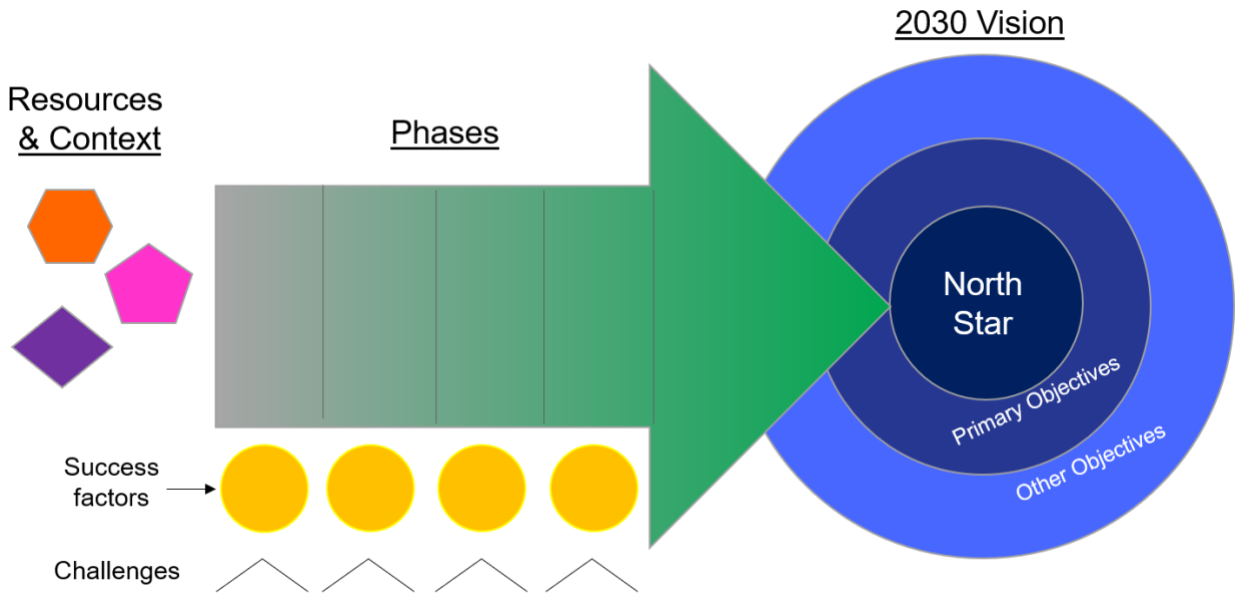
Ultimately, we crafted a common vision to share with all tribal members. This work forms a starting point from which we can iterate as we move forward into the vision.

1.4 Approach

The workshop comprised four sections:

- Review work to date
- Set and define tribal energy goals
- Draft a timeline
- Converge and close

We used the Graphic Gameplan designed by David Sibbet as a framework for discussion.



1.5 Findings

The tribe defined their driving objective as energy independence and the establishment of a Tribal Utility Authority (TUA). There are several versions of what a TUA might be. Two basic types are:

1. Totally independent - "Cut the cord" and develop a microgrid that is entirely independent and not tied into the grid at all.
2. Stay connected to the grid, but develop an alternative means of interconnection that the Tribe owns.

For the present, the tribe is embracing the first definition, developing a reservation-wide microgrid or minigrid with all necessary power generation and distribution infrastructure.

In order to progress toward the vision of a TUA, we identified microgrid and pure solar projects that can provide economic and resilience benefits now while taking advantage of various funding opportunities. These assets will then eventually become part of the TUA and enable energy sovereignty for the tribe.

2 Tribal Values

We began our discussion with the tribe's core values and how they translate to the energy approach. We began with the Bad River Band's mission statement:

To work toward a more progressive, financially stable government, to maintain tribal sovereignty, and enable members to progress individually towards a more fulfilling life culturally, spiritually, and economically.

We identified that each of the values in the tribe's mission statement manifested in a particular way specific to energy vision:

2.1 Progressive and Financially Stable

- Maximize resources at minimum cost
- Achieve 100% sustainability; assisting the region with the same endeavors
- Add renewable energy every year to tribal programs
- Adopt clean energy – reduce carbon footprint
- Reduce carbon emissions
- Establish freedom from fossil fuels and fossil fuel companies

2.2 Tribal Sovereignty

- Create independence and resiliency under tribal control for the strength and benefit of the people, land, and water
- Increase energy independence
- Develop tribe's energy commission; control electric energy on the reservation
- Produce energy on their own as a Tribe

2.3 Enable Members to Progress Individually

- Create good paying jobs
- Establish independence and resiliency for the strength and benefit of the people, land, and water

3 Ten Year Goal: Energy Sovereignty

3.1 Defining Energy Sovereignty

We began by defining energy sovereignty for the tribe. This evolved into the core of the discussion at the workshop and the heart of the vision.

- Become more energy independent and increase renewable energy
- Develop tribe's energy commission; control electric energy on the reservation
- Produce energy on their own as a Tribe

- Establish freedom from energy company monopolies; self-sufficiency
- Maintain energy level at resource level
- Break from payment for electricity to for-profit companies; investing instead in the tribe
- Distribute energy under tribal control
- Control energy needs and usage on the reservation
- Regulate energy generation sources and price
- Create ability to control and regulate tribal energy use
- Establish control at the source
- Eliminate electric bills
- Use clean and self-controlled energy done our way
- Eliminate dependence on any one else for our need for energy
- Institute ownership under Anishinaabe values

3.2 Board seats at Bayfield Electric

A significant portion of the discussion on sovereignty began with suggesting tribal members or friends of the tribe running for seats on the board of directors at Bayfield Electric Cooperative (BEC). There are 9 board seats available, corresponding to each of 9 geographic districts in the BEC service territory. Elections for each district occur every three years, with three different districts up for reelection each year. A person must be a BEC member living within the district for which they are running, and they must collect 10 petition signatures in order to be nominated. Voting occurs at an annual membership meeting.

If the tribe (or friends of the tribe) can occupy 5 of the board seats, they can control a majority on the board of directors. This would allow them to exert influence over the transmission, distribution, and generation decisions made by BEC. It would also allow them insight and potential representation on the Dairyland Power board, as one member of the BEC board is appointed to represent BEC to Dairyland, the regional power authority.

Representation or majority on the BEC board would support the goal of Tribal Sovereignty in the near term, empowering the tribe to play an important role in local energy decisions beyond the reservation.

3.3 Owning Generation and Distribution

A major key to the long-term plan of energy sovereignty through a Tribal Utility Authority is tribal ownership of power generation and distribution infrastructure.

3.3.1 Solar power

Solar power is a major focus of generation for the tribe, as it is completely renewable with zero emissions.

Solar power may be installed behind the meter to serve individual facilities. In this configuration, solar power can be used to offset energy purchases from the grid, and when used in concert with battery energy storage, can provide resilience in the case of grid outage. In the long term, if the tribe should choose to take the entire reservation off the main grid and form a TUA, solar generation at individual

facilities can provide a significant amount of generation without the need for complex distribution infrastructure.

The tribe may also install solar power as a community solar project. In the short term, while connected to BEC, the energy from such installations would be returned to the grid, enabling members of the Bad River community to benefit from a credit on their electric bill. This credit can be applied to any meter, but since many of the larger facilities will have their own solar generation behind the meter, these credits would be ideal for residential tribe members. In the long term, a community solar array could be disconnected from the Bayfield system and connected into the future Bad River TUA system as a significant source of renewable energy generation.

3.3.2 Battery energy storage

Solar power alone cannot provide the energy coverage needed to go completely off grid. When the sun goes down, the electricity stops. Battery energy storage augments the performance of solar in both grid-connected and microgrid modes.

In the near term, the plan will be to install battery storage at all main tribal buildings currently on commercial rates. This enables the tribe to take advantage of economic benefits of operating the batteries to offset energy and demand charges. The battery storage systems allow the solar power to adapt to an islanded mode in case of grid outages.

In the long term, battery storage systems will become important foundational elements of the tribal microgrid or TUA, enabling solar and other intermittent forms of energy to be stored locally and then distributed throughout the tribal network.

3.3.3 Woody biomass

As previously mentioned, the tribe is currently served from Bayfield Electric's 5MW substation, which is fed from Xcel's transmission line in Ashland. Subtracting the electricity supplied by that substation for members that are not on the reservation, and subtracting transmission line losses, less than 5MW generation baseline capacity is needed to replace the tribal load. An engineering study would be needed to estimate this exact load, but with planning for future expansion, a 4-5MW load could be a ballpark design load for a woody biomass plant.

This renewable energy source uses abundant biomass resources available on the reservation and is already managed and maintained by the tribe. Biomass generation provides a consistent energy source without the intermittency issues of solar or wind. It may also provide the opportunity for combined heat and power (CHP), increasing the efficiency of the fuel.

The downside to locating a woody biomass plant on the reservation is the expected resultant degradation in air quality from burning wood as fuel. The Bad River tribe employs several air quality experts who provide continuous monitoring and feedback on air quality issues and will be involved in any discussion of the woody biomass fuel option in the future.

3.3.4 Supplemental thermal generation

Though adopting solar plus battery storage supports the tribe's goal of minimizing dependence on fossil fuels, it would be cost prohibitive to support the entire energy load with those sources alone. Due to extended cloudy and snowy weather in Wisconsin, long periods of darkness, and low sun angle in the

winter, for example, we recommend that the tribe consider thermal generators as a supplemental source to endure in extreme situations. Natural gas or diesel generators can be fired up quickly and utilized only when needed. They could be used to charge batteries, as well as provide electricity directly. As a cost savings, existing generators could be considered in light of the current upgrades being planned.

The drawbacks of using thermal generation include: relying on fossil fuels, using nonlocal energy, and lacking price controls on the fuel used in this way. Yet, if used as backup power and operationally minimized, this alternative is still worth considering.

3.4 Secondary Objectives

While the tribe's long range energy plan primarily focuses on providing electrical power and heat to the tribe members, a large-scale undertaking such as energy sovereignty or a TUA creates far reaching effects and impacts for the tribe. The council aims to shape these impacts to benefit the people, land, and water, in line with the tribal mission statement.

These secondary objectives include electric vehicle infrastructure, food sovereignty, and tribal jobs.

Electric Vehicle Infrastructure

Designing energy infrastructure with extensibility and interoperability to support electric vehicle charging can further support the tribe's objectives. Electric vehicles on the reservation may include tribe or member owned passenger vehicles, casino guest/visitor vehicles, and public utility vehicles, such as snow removal equipment.

Food Sovereignty

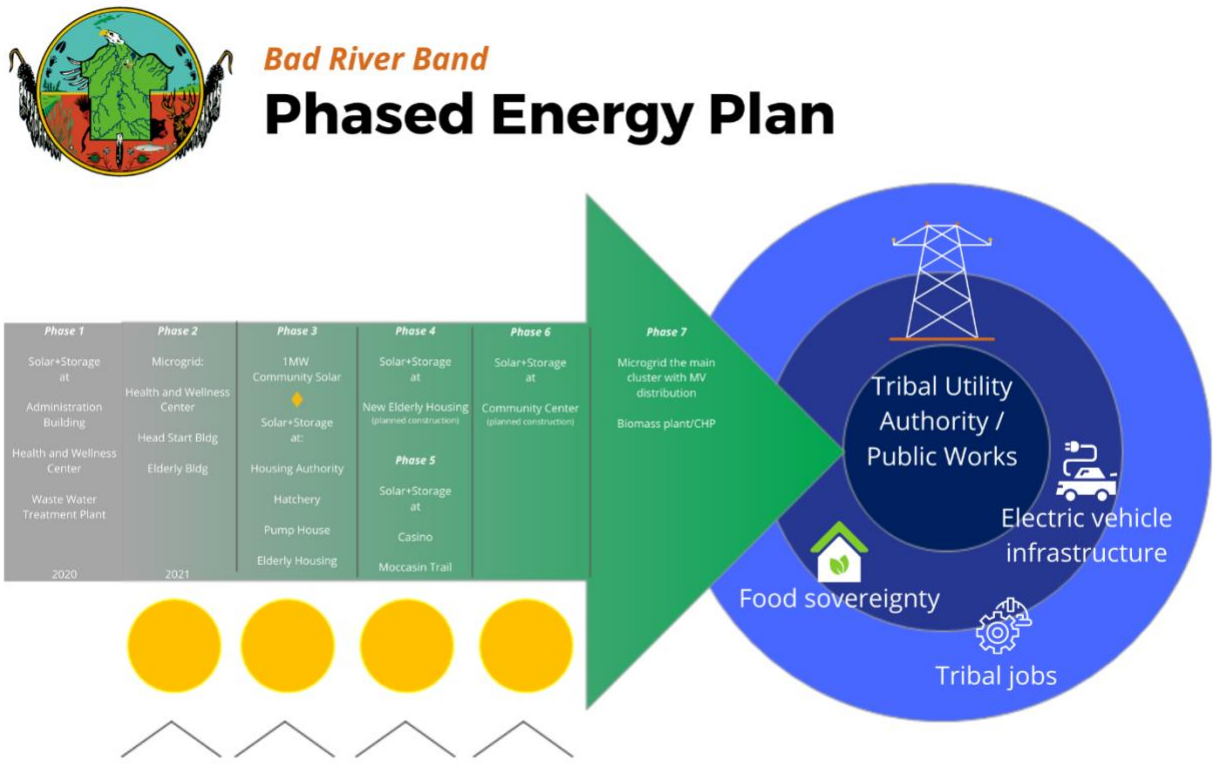
The tribal food sovereignty office already operated indoor and outdoor growing facilities, providing fresh produce to tribal members in season. Adding sustainable electrical and heat infrastructure to greenhouses could enable year-round growing and production.

Tribal Jobs

Adding the capabilities and infrastructure required to form a TUA and power the reservation will create jobs and job opportunities for tribal members. These jobs will range from TUA administration to infrastructure maintenance and require skills and training that will enrich tribal members. All decisions about energy projects and infrastructure should keep tribal job creation in mind.

4 Phased Implementation Plan

The tribe chooses to make the path to TUA and energy sovereignty a phased approach, adding assets and infrastructure incrementally. This allows the tribe to apply for grant funding for projects along the way within the boundaries of those funding opportunities. It also allows the tribe to incorporate lessons learned and to iterate the plan along the way as new information and experience becomes available.



Phase 1, currently in progress, includes adding solar plus storage for the Administration Building, the Health and Wellness Center, and the Waste Water Treatment Plant. This phase initiates the tribe's first steps toward the unified goal of energy sovereignty with an actionable plan. The solar plus battery storage at these three essential tribal buildings will be substantially supported by the grant through the Department of Energy and the goal is to complete phase 1 in 2020.

The plans for Phase 2 take further steps with the Health and Wellness Center. Since the HWC is geographically co-located with the new Head Start Building and Elderly Building, we will investigate the feasibility of forming a microgrid among these facilities, adding energy assets where appropriate to size the microgrid.

Phase 3 could include 1MW of Community Solar, providing renewable energy to offset residential energy use on the reservation and also providing utility bill savings for those residents. Phase 3 may also include a suite of resilient solar-plus-storage projects to several more buildings: Housing Authority, Fish Hatchery, Pump House, and the existing Elderly Housing.

Phase 4 will add solar plus storage to the newly built Elderly Housing, and it is anticipated to begin construction in the next 1-3 years.

Phase 5 will expand the focus to include not only solar plus storage for the Casino and Moccasin Trail areas, but also the development of a PV plan for the Casino. This could include adding a PV carport or connection to the Health Clinic microgrid, improving the swimming pool, and increasing the microgrid. Since these are commercial centers for the tribe, federal grant funding will most likely be unavailable to these projects. However, with previous successful projects operational, the tribe will have sufficient knowledge and experience to undertake these projects.

Phase 6 adds solar plus storage and microgrids for the planned Community Center.

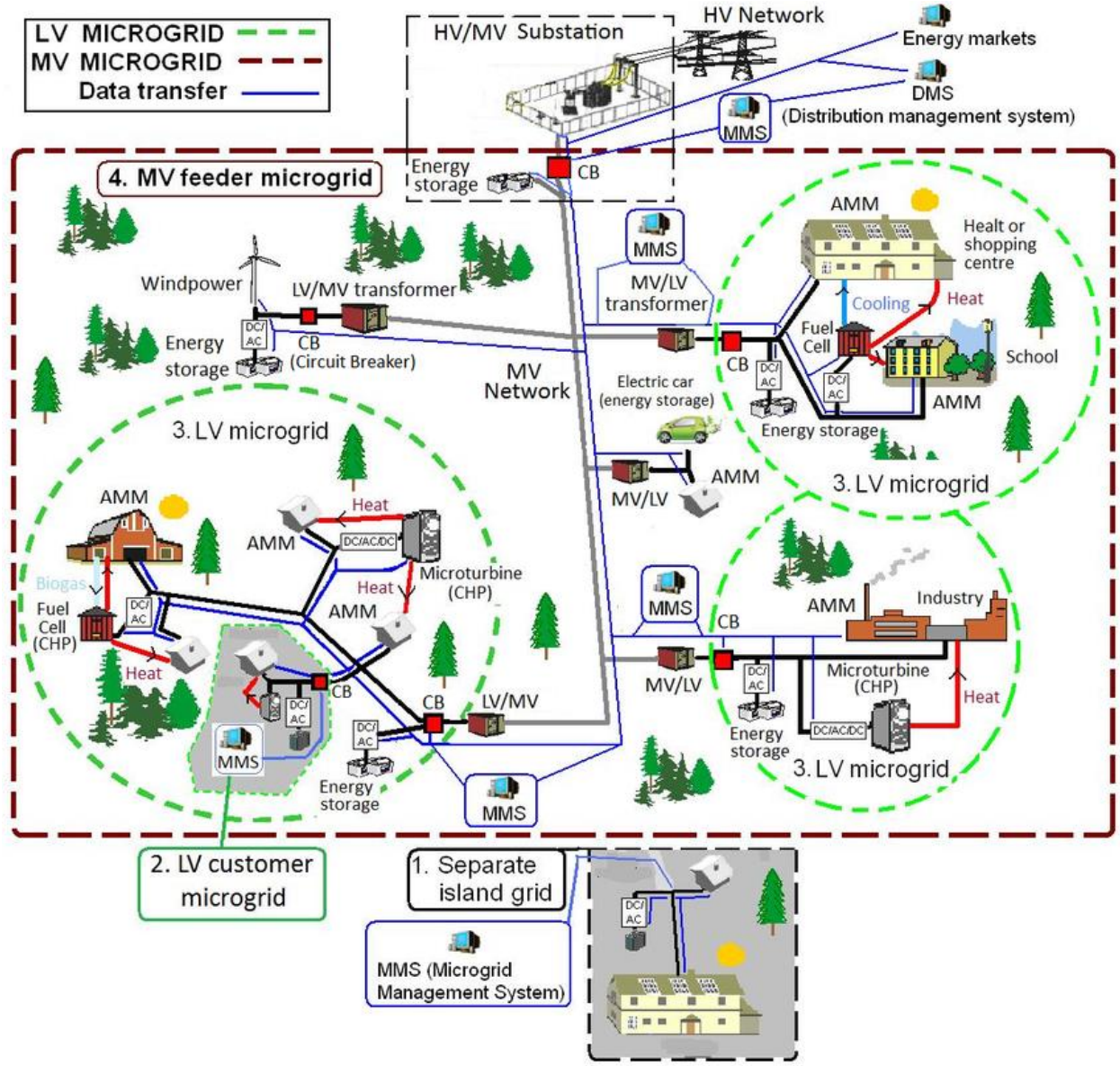
Phase 7 expands to connect the microgrids and to introduce a woody biomass plant to provide consistency alongside solar and storage, in addition to potentially producing heat offtake.

Phase 8 completes the tribal vision to form Tribal Utility Authority, adding the Transmission Infrastructure, tying in the Aspen Acres Cluster, Old Odanah, Birch Hill, and the SE cluster, uniting all tribal facilities in Energy Independence.

Tribal facilities

Phase 1 (Currently in Progress)	Solar plus storage: • Administration building • Health and Wellness Center • Waste Water Treatment Plant
Phase 2	Microgrid: • Health and Wellness Center • Head Start Building (potentially add storage) • Elderly Building (potentially add storage)
Phase 3	1 MW Community Solar AND/OR Solar plus storage: • Housing Authority • Hatchery • Pump House • Existing Elderly Housing
Phase 4	Solar plus storage: • New Elderly Housing
Phase 5	Solar plus storage/microgrids: • Casino • Moccasin Trail
Phase 6	Solar plus storage/microgrids: • New Community Center
Phase 7	Biomass plant / CHP Microgrid the main cluster
Phase 8	Tribal Utility Authority: • Transmission Infrastructure • Tie in Aspen Acres Cluster • Tie in Old Odanah • Tie in Birch Hill • Tie in SE Cluster

The following figure shows a notional image of a microgrid network, which could be representative of the ultimate solution space at Bad River. Please note that this is a general image, not specific to Bad River. Certain technologies on the figure may not be under consideration. Likewise, technologies readily accessible to the tribe, such as woody biomass, may not be explicitly listed.



5 Conclusions and Next Steps

Ultimately, the outcome of the workshop emphasized the tribe's desire to move toward Energy Sovereignty as a unified vision and ten-year goal. Specifically, this vision takes the form of a Tribal Utility Authority and tribal ownership of energy generation, storage, and distribution assets.

Though a comprehensive eight phase plan is now in place, there are still some outstanding questions that remain:

- What does Tribal Utility Authority actually mean for the Bad River Band? Is it most beneficial to completely own the tribe's generation assets and be an entirely independent microgrid? Or could it mean owning the transmission/distribution assets, while staying connected to the grid with an alternative means of interconnection?
- What is the best way to provide heat to the tribal buildings?
- How do we build to fully support an electric vehicle infrastructure?

The next steps of this Long-Range Energy Plan will necessitate answering the outstanding questions above, actively following the outlined eight-phase plan, and iterating the plan as new experience and information adjusts our course.